

2019 ROSENBAUER BRUSH ENGINE



Revised 8/19/2020

This document and additional reference documents regarding this breed of apparatus are available at:

<https://www.montgomerycountymd.gov/mcfrs-psta/driver//DriverTrainingKnowledgeBase.html>



Dimensions & Weight

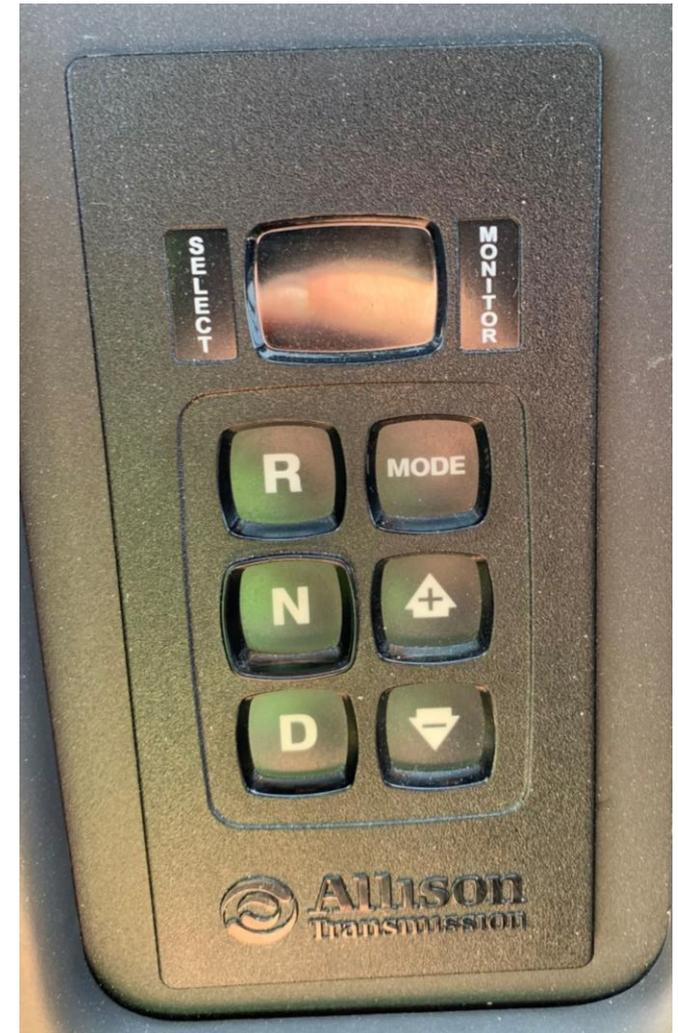


- Overall height: 10' 5"
- Width:
 - 9' 7" mirror to mirror
 - 9' 2" body width
- Overall length: 31' 4"
- Actual Weight
 - Brush Engine 722 fully equipped with all tanks full and no personnel onboard
 - ✓ Front axle – 11,600lbs
 - ✓ Rear axle – 19,940lbs
 - ✓ Total actual weight – 31,540lbs

Powertrain Systems



- Freightliner M2 Chassis
- Motor: Cummins L9 350hp
- Transmission: Allison 3000 EVS 5-speed
 - TES-295 synthetic fluid
 - Maximum speed is 65mph



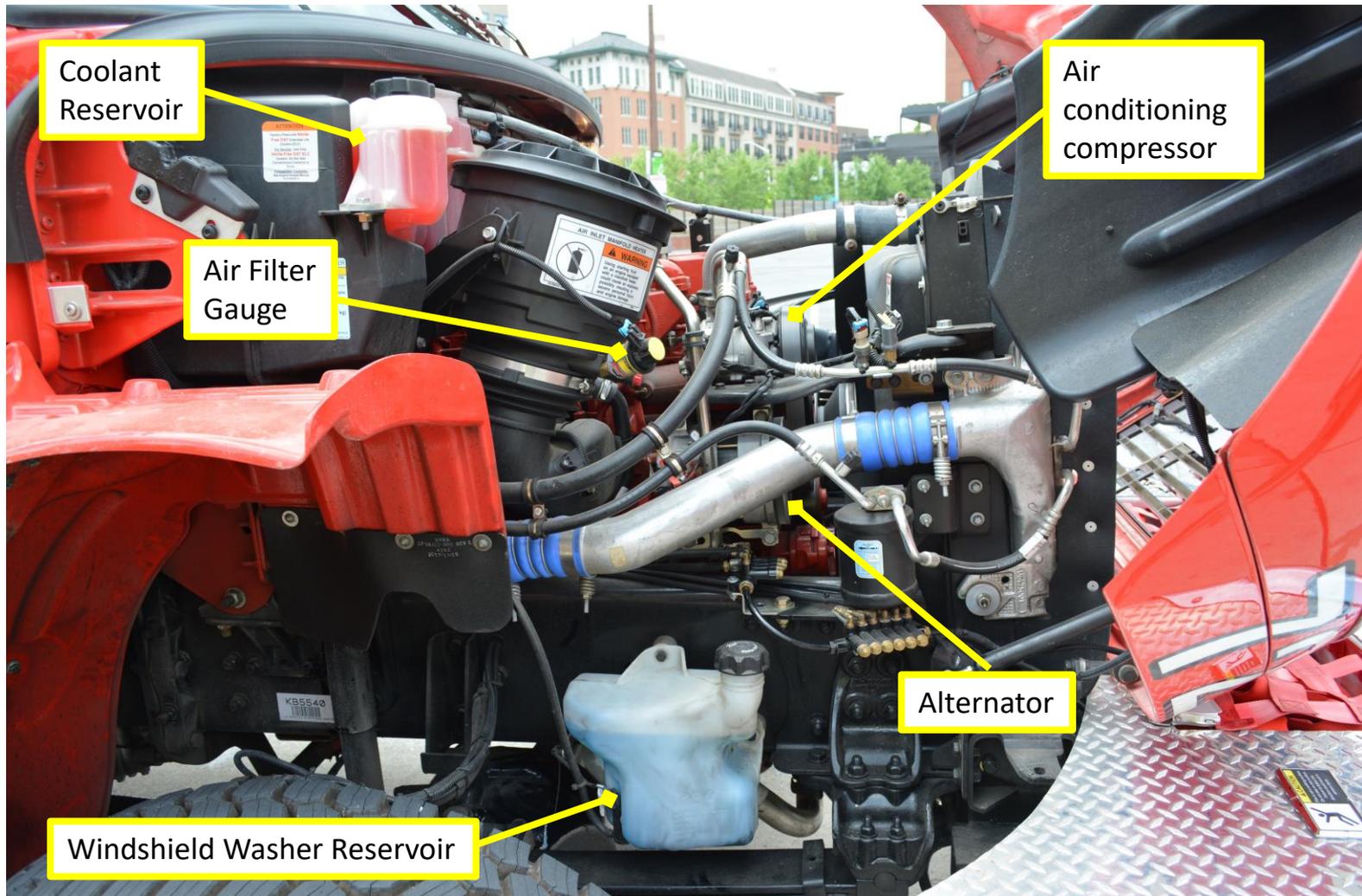
Transmission Fluid



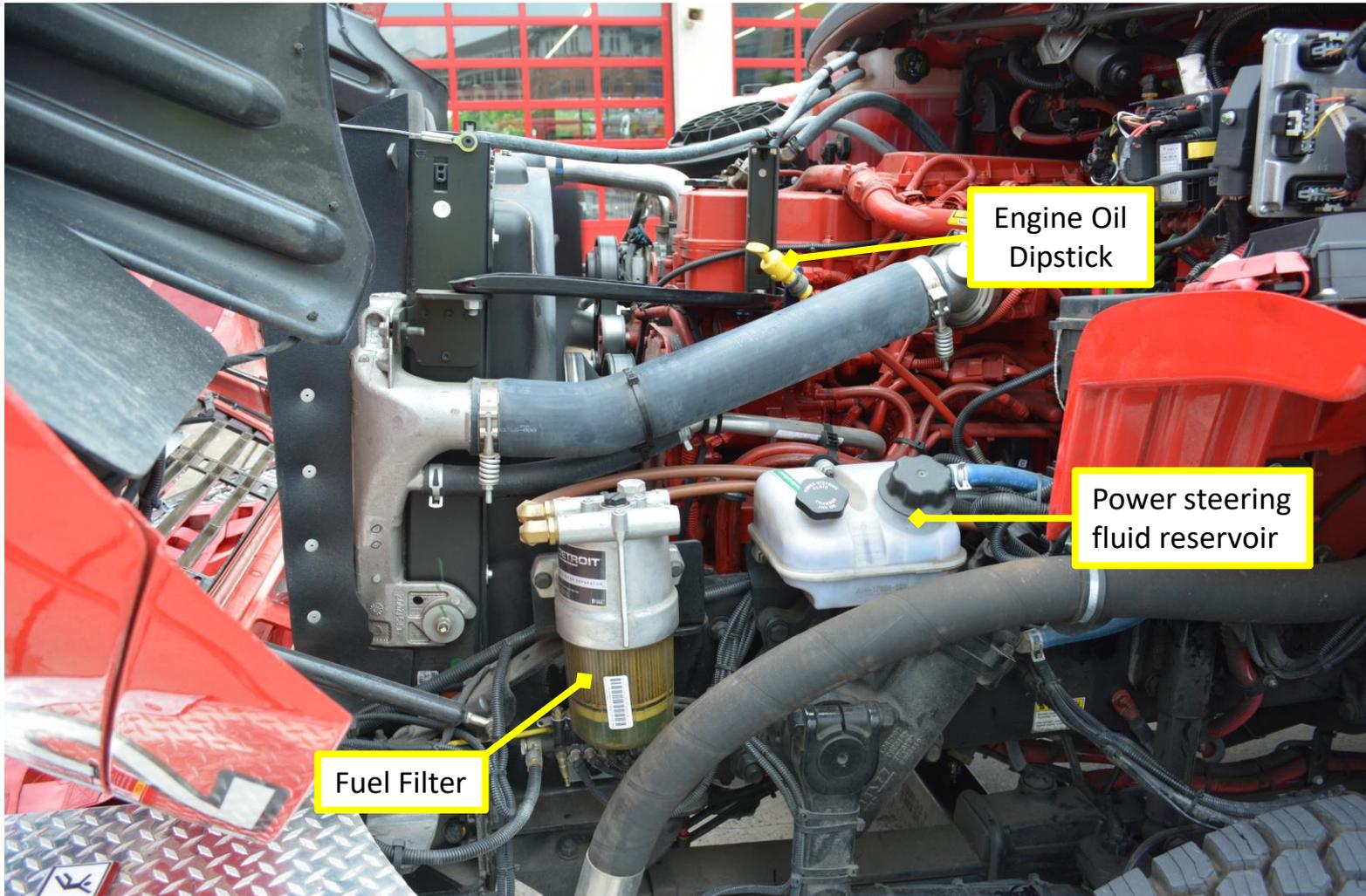
- Fluid level check
 - Selector in Neutral
 - Temperature 140 to 220°F
 - Engine at idle and parked for >2 minutes
 - Level ground
- Press both arrow buttons simultaneously to check fluid level; status displayed on selector pad screen
- OL will be followed by OK, -1 thru -7, or +1 thru +7.
 - The – indicates under filled and the + indicates overfilled.
 - The numeral indicates the number of quarts.
- Any other message indicates a problem and CMF should be notified.
- Always confirm the digital reading by visually checking the dipstick BEFORE adding fluid.



Motor Compartment



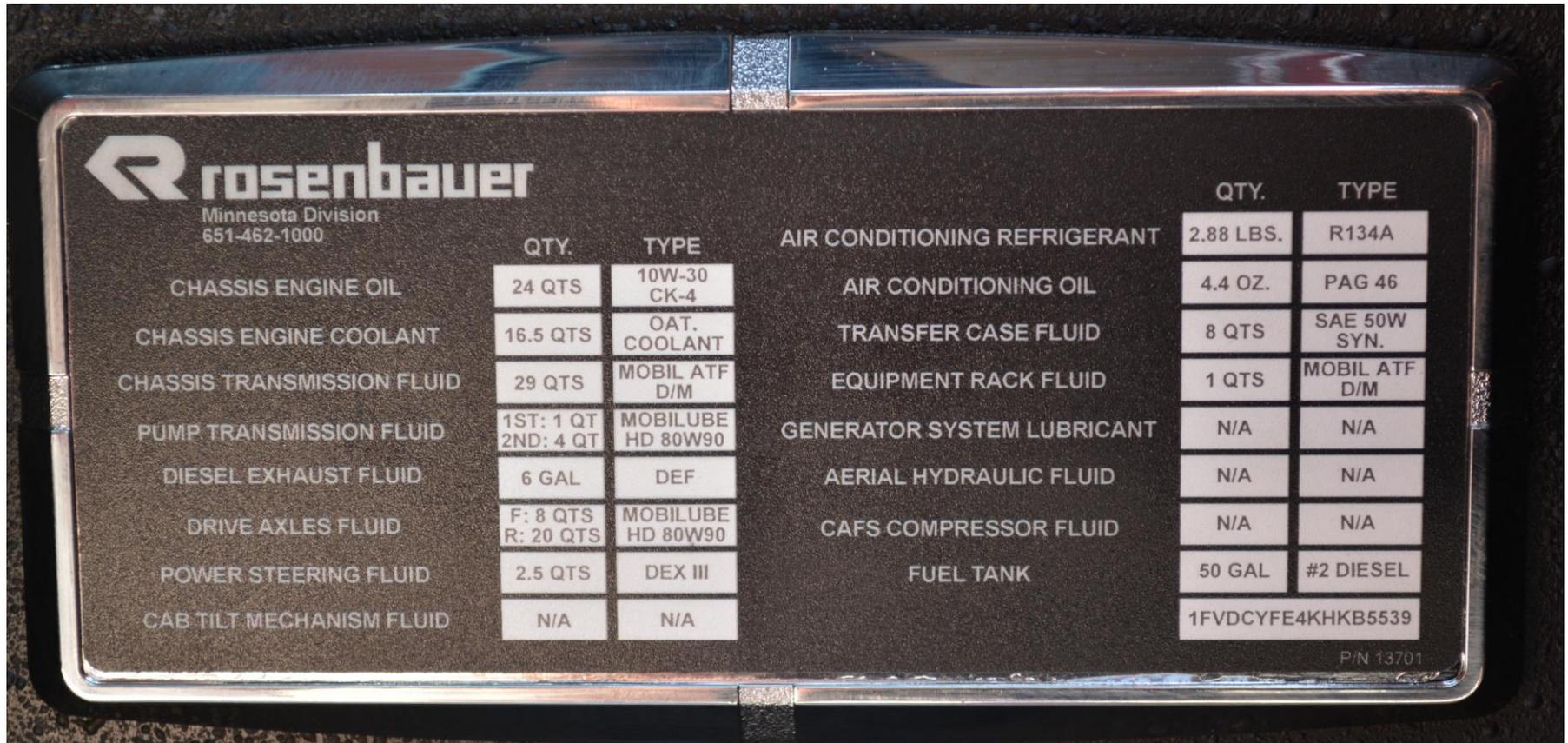
Motor Compartment



Data Plate



- Located at the driver's seat side of the center console
- Always verify fluid type before adding



Traction Systems



- **Automatic Traction Control (ATC)**

- applies the service brake to a spinning wheel so that the torque can be transferred through the differential to the wheel that has the traction
- reduces engine torque when both wheels are spinning to improve traction
- ATC light located in the cab will light when the ATC feature is active
- There is NOT a switch to deactivate ATC; ATC is automatically deactivated when in All-Wheel Drive

- **Differential Lock**

- Applies power equally to both sides of the drive axle where greater traction is required
- Switch located above the transmission selector pad
- Lock the wheels only when the vehicle is stopped or moving at very low speed, less than 5 mph. Never lock the wheels when the vehicle is traveling down steep grades or when the wheels are slipping.
- Do not exceed 25mph and disengage when traction improves



All Wheel Drive



AWD - All Wheel Drive

Press up to engage and disengage power to the front axle

Travel steadily below 10mph during shift

Transfer Case Range

UP = All Wheel Drive LOW
DOWN = All Wheel Drive HIGH

Vehicle must be stopped and transmission must be in neutral before using this switch.



All Wheel Drive



Range	Disengaged Steer Axle		Engaged Steer Axle	
	Traction Conditions	Applicable Vehicle Speeds	Traction Conditions	Applicable Vehicle Speeds
HIGH RANGE	Most normal driving conditions (such as dry or wet pavement or mixed road surfaces) when moderate to high vehicle speeds are appropriate.	0 mph (0 km/h) to maximum vehicle speed	When more traction is needed at moderate to low vehicle speeds on dirt or gravel surface with shallow to moderate grades (8% maximum), icy or snow-covered roads, or hard-packed sand.	20 mph (32 km/h) or less
LO RANGE	Not applicable. Do not use LO RANGE unless the steer axle is engaged.		When maximum power and maximum traction is needed on steeper grades (15% maximum), deeply rutted tracks, deep mud or snow, extremely rocky surfaces, or soft, loamy sand.	15 mph (24 km/h) or less

IMPORTANT: Engaging the steer axle will increase the turning radius of the vehicle.

Do not engage AWD on paved surfaces or surfaces with good traction – damage to the drivetrain and tires will occur.

When disengaging AWD - If the steer axle driveline does not disengage, the steer axle driveline coupling may be in a bind. Turn the steering wheel back and forth while driving, or briefly drive the vehicle in reverse.

AWD – Transfer Case Range



- Uses an air cylinder to shift between HIGH RANGE and LO RANGE.
- Shift between HIGH RANGE and LO RANGE, as follows:
 1. Stop the vehicle.
 2. Shift the transmission to NEUTRAL.
 3. Apply the parking brake.
 4. Move the dash-mounted switch to the HIGH or LO RANGE position to pressurize the shift mechanism in the transfer case. An audible engagement may be heard (which is normal).
 5. Shift the transmission to FIRST gear and apply light torque to test the engagement.



If the shifter does not engage when shifting from HIGH RANGE to LO RANGE, shift the transmission into REVERSE, then NEUTRAL, and apply light torque to engage the LO RANGE.

See [Freightliner M2 Driver's Manual](#) for more info.

After-Engine Exhaust Treatment

- Vehicle is equipped with diesel exhaust fluid and a diesel particulate filter



DPF and exhaust
temp warnings



REGEN Switch

See [Freightliner M2 Driver's Manual](#) for more info.

Regeneration Indicators

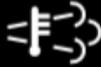


IMPORTANT	
<p>DPF Regen Needed</p> 	<ul style="list-style-type: none">• Diesel Particulate Filter (DPF) regeneration is needed.• If flashing, regenerate as soon as possible. Engine derate possible.
<p>Hot Exhaust</p> 	<ul style="list-style-type: none">• Hot exhaust can cause fire.• Keep flammables and people away from exhaust.
<p>DEF Refill Needed</p> 	<ul style="list-style-type: none">• Diesel Exhaust Fluid (DEF) level is low. Engine derate likely.• Refill tank with certified DEF.
<p>See operator's manual or glove compartment card for complete instructions. 24-01656-000</p>	

Regeneration Indicators



EXHAUST AFTERTREATMENT SYSTEM INFORMATION

INDICATOR LAMP(S)	 (Solid) Level 1	 (Flashing) Level 2	 (Flashing) CHECK Level 3	 (Flashing) CHECK STOP Level 4	 WARNING 
Indicator Lamp Message(s)	Filter Regeneration Recommended	Filter Regeneration Necessary	Parked Regeneration Required – Engine Derate	Parked Regeneration Required – Engine Shut Down	HEST (High Exhaust System Temperature)
Diesel Particulate Filter Condition	Filter is reaching capacity.	Filter is now reaching maximum capacity.	Filter has reached maximum capacity.	Filter has exceeded maximum capacity.	Flashing A regeneration is in progress.
Required Action	Bring vehicle to highway speeds to allow for an Automatic Regeneration or perform a Parked Regeneration.	To avoid engine derate bring vehicle to highway speeds to allow for an Automatic Regeneration or perform a Parked Regeneration as soon as possible.	Vehicle must be parked and a Parked Regeneration must be performed – engine will begin derate.	Vehicle must be parked and a Parked Regeneration or Service Regeneration must be performed. Check engine operator’s manual for details –engine will shut down.	Solid Exhaust Components and exhaust gas are at high temperature. When stationary, keep away from people and flammable materials or vapors.
For a driver performed Parked Regeneration, vehicle must be equipped with a dash mounted Regeneration Switch.					

See Engine Operator’s Manual for complete Regeneration Instructions.

24-01583-000B

Active Regeneration



- Due to the type of travel typical of fire apparatus “active regeneration” is most common
- Active regeneration occurs:
 - a. When an intervention by the operator during travel or pumping operations creates correct conditions for regen
 - Requires sufficient exhaust flow and temperatures
 - Speedometer >5mph
 - NO engine speed variations will occur when pumping or driving
 - b. Manually by activating the DPF Regen switch while parked

Regeneration will not change motor RPM during pumping operations if it engages automatically.

Parked Regeneration



To initiate a parked Regen, perform the following steps

1. Park the vehicle away from all flammable materials, set the parking brake, and put the transmission in neutral
2. Start and warm the engine until the coolant temperature is at least 150 °F
3. Press and hold the REGEN switch for 5 seconds. As the regen process is initiated, engine rpm increases and the HEST lamp illuminates to indicate extremely high exhaust temperatures.

Parked regen will only occur if the DPF lamp is illuminated.



Parked Regeneration



4. The regen cycle will finish after 20 to 60 minutes, at which time engine idle speed drops to normal and the vehicle can be driven normally. The HEST lamp is extinguished when vehicle speed exceeds 5mph or the system has cooled to normal operating temperature.
5. To stop a parked regen at any time during the process:
 - Depress the brake pedal or accelerator pedal
 - Shut down the engine

Beware that undercarriage and exhaust components may remain hot for some time following regeneration and could result in vegetation below the vehicle igniting. Exercise great caution if off-road operations are required after a regeneration cycle.

Fuel & DEF



- Diesel Fuel
 - Fill located behind driver's step
 - 50 gallon capacity
- Diesel Exhaust Fluid (DEF)
 - Fluid level displayed on dashboard gauge panel
 - 6 gallon tank
 - Fill at driver's step co-located with diesel fuel fill
 - Light blue cap



The caps are immediately adjacent to one another
The diesel fuel cap is silver and the DEF is **BLUE**

Exhaust System



- Exhaust outlet is 6" diameter
 - Crimson is 5"
- PlymoVent boots will accept up to 6 ¼" exhaust outlets
 - **The fit is tight!**
- Check your mirror to ensure the hose disengages from the exhaust when exiting the station
- Until the rubber molds to the larger tailpipe the boot may need to be manually disengaged

PLYMOVENT®



**Slow and steady
departures from the bay
are necessary.**

Suspension & Brake Systems



- 14,000lb front axle
- 24,000lb rear axle
- Anti-lock drum air brakes front and rear axle
- 18.7cfm air compressor
- 12v ViAir 330C-IG auxiliary air compressor behind center rear seat
 - Powered by shoreline to maintain brake system while parked
- Heated air dryer on wet tank
- Steel air storage tanks
- Air tank drain actuator – driver side under first compartment and to rear of rear wheels



Starting & Stopping the Motor



- Turn on battery switch and turn ignition to “ON”
- Allow gauges to sweep
- Turn ignition key clockwise until vehicle starts

Allow gauges to complete their sweep before attempting to start the motor. Failure to wait can result in false sensor alarms.

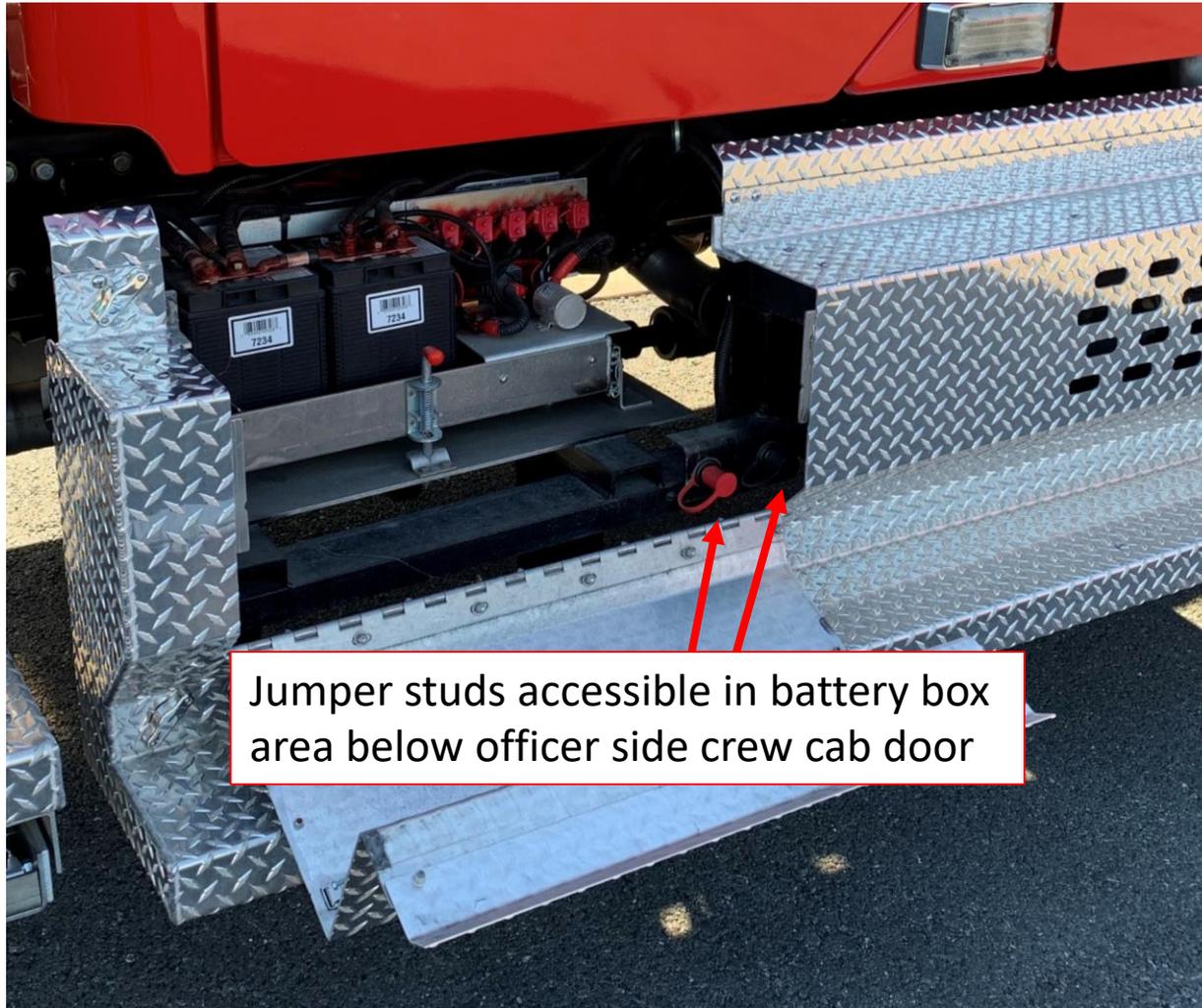


Battery switch



Ignition Key required

Jumper Studs



Jumper studs accessible in battery box area below officer side crew cab door

Shoreline



- 20 amp, 120v NEMA 5-20 plug with bar indicator light
- Supplies IOTA DSL45 battery conditioner and auxiliary air compressor



**Despite label on the cover -
This is not an auto-eject plug.
Must be unplugged manually**

Auxiliary Light Controls

- Located in center console
- Master Warning controls all warning lights
 - No zoned controls – all or nothing



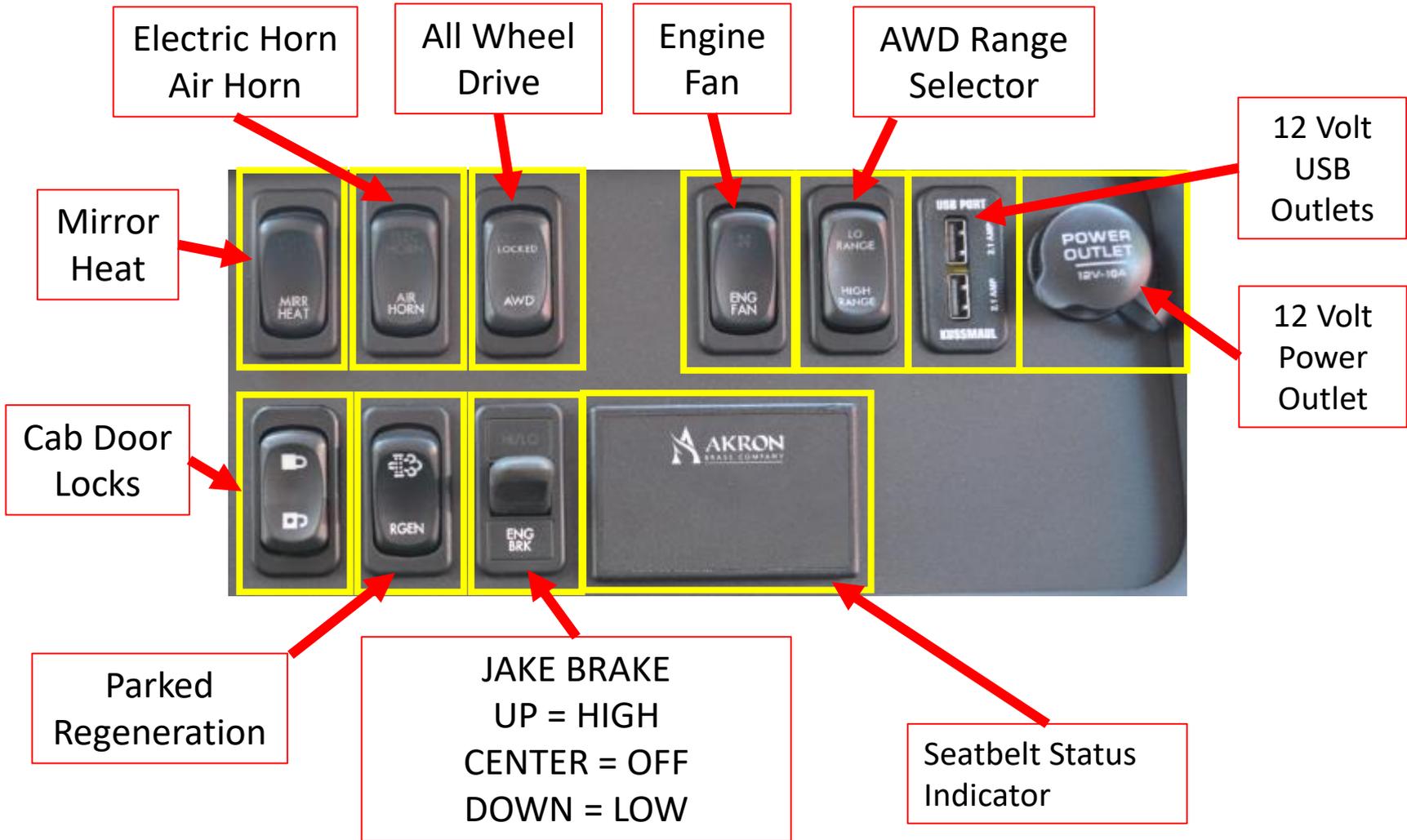
LED lights on
front of light bar

LED brow light

LED scene lights
on all four sides

Vogel Lube
Fault

Dash Controls



Engine Fan



- The engine cooling fan can be turned on manually by the engine fan switch on the dashboard.
- The fan will continue to operate for a set amount of time and then turn off unless the coolant temperature is high enough to continue the fan operation.



Rear Camera



- Located above the rear compartment; displayed on screen above windshield
- Always active unless operator manually turns off



Suppression Features



rosenbauer PERFORMANCE
Minnesota Division
651-462-1000

PUMP MAKE	HALE	GPM	PRESSURE	ENGINE RPM		
HALE	HALE	1251	150 PSI	1471		
CAPACITY	1250 GPM	DATE MFG.	31-OCT-2018	882	200 PSI	1590
MODEL NO.	QFLO PLUS 125-23L	634	250 PSI	1743		
SERIAL NO.	H18282	GOVERNOR SPEED	2390 RPM			
PRODUCTION NO.	MN14442	GEAR RATIO	1 : 2:32			

GSE No. 13700



- Hale 1250gpm single stage Qflo pump
 - For operations, features, and maintenance details go to [Hale Pump Operating & Maintenance Manual](#)
- Auxiliary Hale CBP PTO Pump
- Hale Total Pressure Master (TPM) system
- Trident air primer
- 500 gallon water tank

No CAFS
No integral Class A or B foam tank
No Autofill

Pump Shift & Engagement

In-cab signs of successful pump shift

- ✓ Indicator lights beside shift lever
- ✓ Speedometer rises

Pump panel signs of successful pump shift

- ✓ Throttle ready light illuminated
- ✓ Pressure rise on main discharge gauge (assuming a wet pump)
- ✓ Auto light lit on pump primer (assuming AUTO mode)



There is no manual override for the pump shift.



Pump Panel – Driver Side



- Rear Crosslay
- Hose Reel
 - Pump and Roll Capable
- 2 ½" Officer Side
- Deck Gun
- 2 ½" Rear



Pump Panel – Driver Side



- Front Crosslay
- Front Bumper Discharge
 - Pump and Roll Capable
- 2 ½" Driver Side Front

Pump Panel – Driver Side

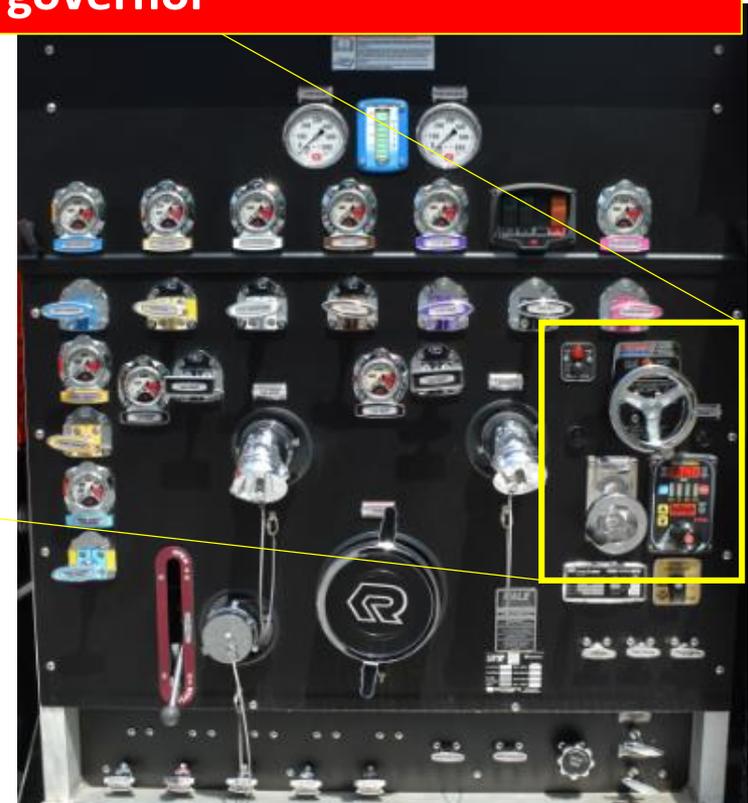


- Auxiliary Controls
 - Panel lights, scene lights, air horn
- Tank Fill (2" piping)
- Officer Side LDH

Pump Panel – Driver Side

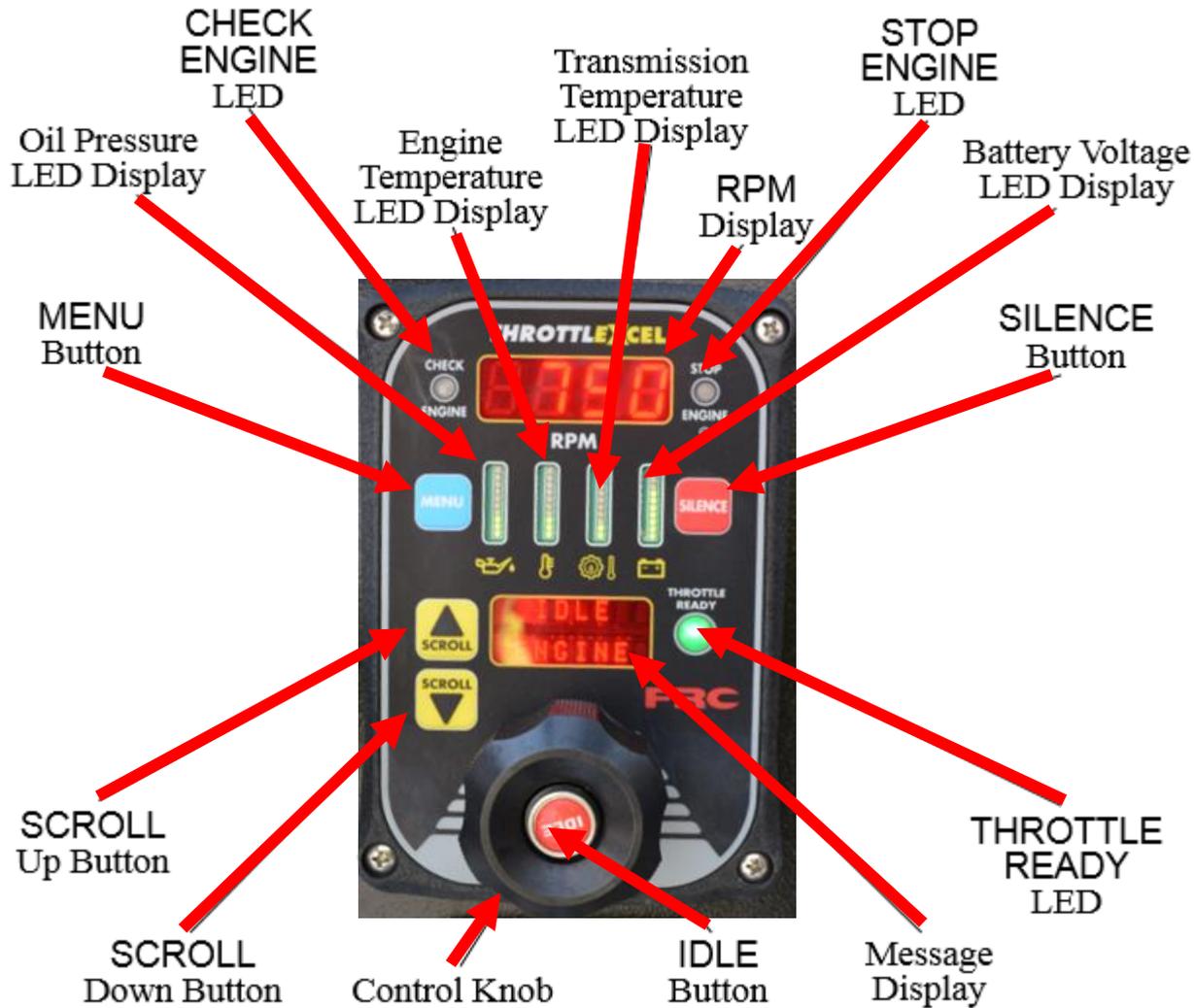


Controls throttle only – not a pump pressure governor



- Thermal Relief Valve (TRV)
- Total Pressure Master (TPM)
- Tank to Pump Valve (4" piping)
- Throttle and Vehicle Systems Monitor

FRC ThrottExcel ELA200



Pump Panel – Officer Side



- LDH discharge
- 2 ½" discharge
- 6" intake
- Equipment rack control

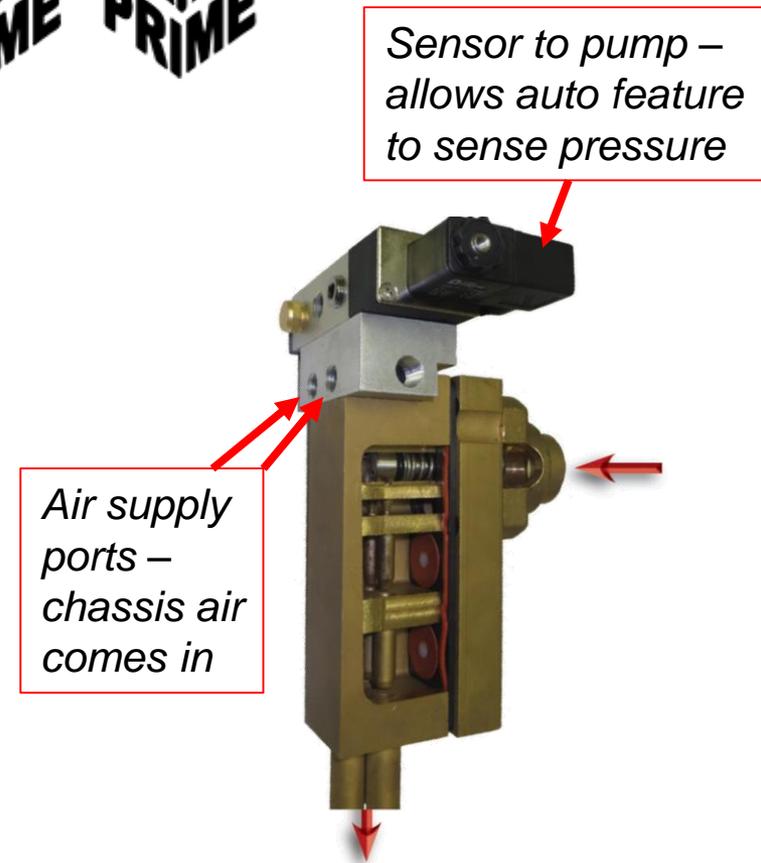


Pump Primer



Trident Air Primer

- Utilizes air supplied by the chassis air brake system to operate the pump primer
 - Up to 15.6 cubic feet per minute
- Very low impact on vehicle electrical system - 0.4 amps
- 27' vertical lift capable
- Two types of controls
 - Manual – Auxiliary Pump
 - Automatic – Main Pump



Pump Primer



- No internal motor, solenoid, or cables
- Brass and steel construction
- Primer design provides automatic draining to avoid freezing
- No lubrication necessary
- No limitation on primer engagement time
 - Only limitation is avoiding running a dry pump in gear



Primer located behind driver side pump panel

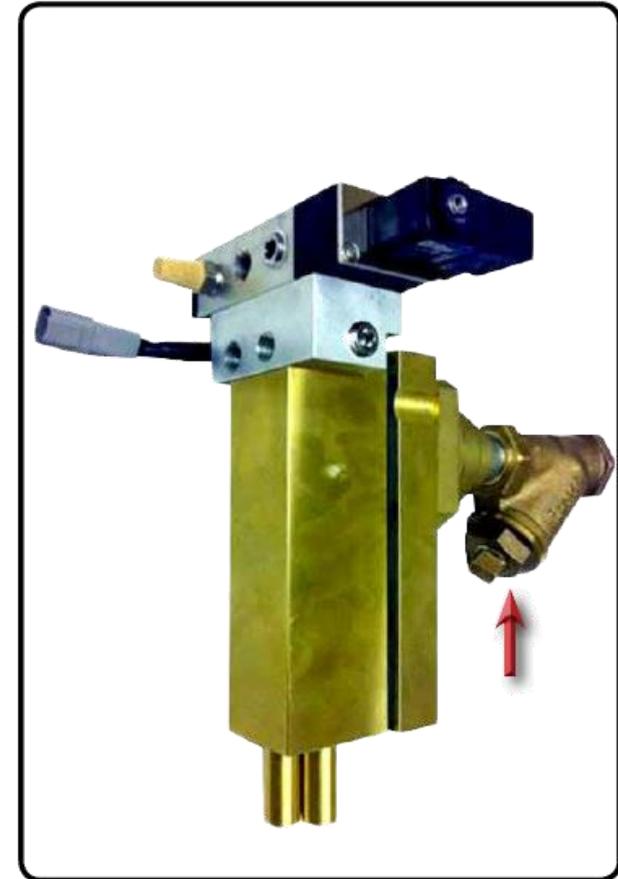
Pump Primer



- No maintenance requirements for operations personnel
- If priming becomes noticeably slow or weak, personnel may check the integral strainer for debris



Separate and Cleanable
Wye Strainer



Integral Strainer on Primer Intake
Shown With Red Arrow Above

Pump Primer – Main Pump

- Primer for the main pump is automatically activated when:
 - ✓ Pump is in gear – “OK to PUMP”
 - ✓ Pump pressure is <20psi; and
 - ✓ Auto Prime is engaged (light is lit)
- Auto Primer can also be disengaged and used manually
 - Depress the control switch downward toward the “PRIME” label
 - Useful for periodic testing of the primer
 - Not normally the desirable mode of operation
- Generally leave the switch set to AUTO



There are no individual manual intake primers on these units.

Auxiliary PTO Pump is not connected to the Auto Primer.

Pump Primer



Additional information resources:

- Troubleshooting Guide
 - <http://www.tridentautoairprime.com/troubleshooting.html>
- Internal Operation Animation
 - <http://www.tridentautoairprime.com/animation.html>
- Trident Website
 - <http://www.tridentautoairprime.com/>

Intakes

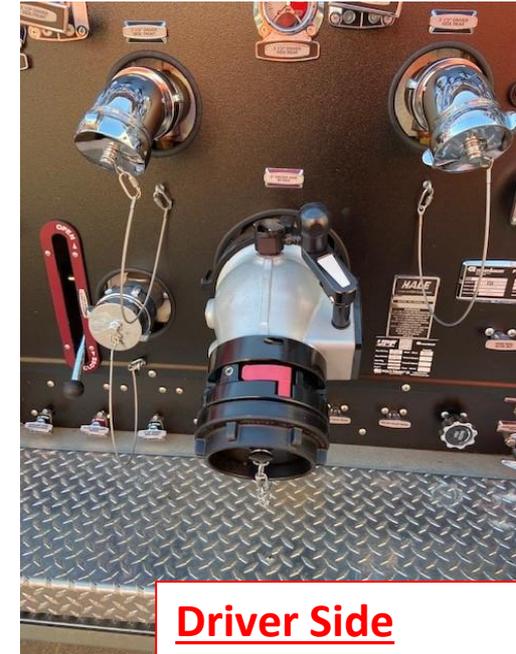


- 3 intakes
 - Driver side main 6"
 - Officer side main 6"
 - 2 ½" driver side auxiliary
- External manual intake valves
 - No electric MIV
- No front or rear intake



Officer Side

5" Storz to 6" NST
(50' - 5" soft sleeve
stored in
compartment)



Driver Side

4" Storz to 6" NST

Note: The absence of internal MIV will result in pump water dumping from the intake during hard sleeve connection for drafting.

Tank Valves



Tank Fill

Manual valve
2.5" plumbing



Tank To Pump

Manual wheel valve
3" plumbing

No electronic or automatic valves associated with tank to pump or tank fill.

Auxiliary Pump



- Equipped with a SEPARATE Hale CBP single stage PTO-driven fire pump to conduct “pump and roll” operation
 - Rated to 250gpm at 150psi
 - Cannot operate simultaneously with Qmax main pump
- Plumbed to Booster Reel and Front Bumper Discharge
- Booster Reel is preferred use

For additional pump information go to the [Hale CBP Pump Manual](#).

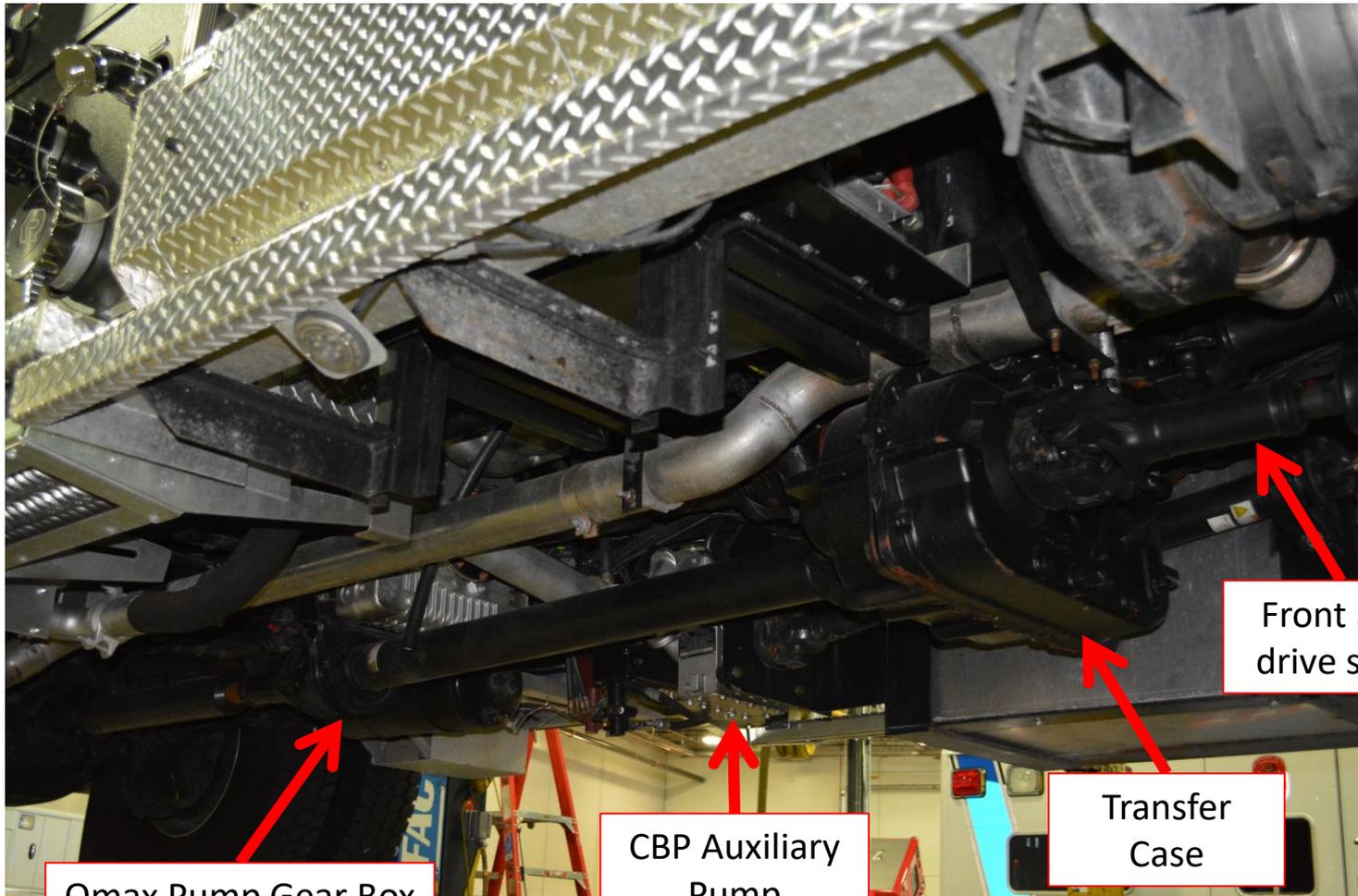
Extreme caution must be used during pump and roll operations to avoid injury to ground personnel and damage to equipment.

Deployed hose may become snagged on obstacles or entangled in the vehicle and must be continually monitored.

Motor RPM must be managed to avoid overpressurizing the hoselines.

Driver should remove headset and roll down windows to permit maximum communication with ground crew. Consider use of talk-around or radio channel to permit direct communication with ground crew.

Auxiliary Pump - Location



Qmax Pump Gear Box

CBP Auxiliary Pump

Transfer Case

Front axle drive shaft

Auxiliary Pump - Controls

- Cab Controls
 - Located on center console next to driver
- Pump pressure display located next to Warning Master switch



Pump And Roll - Engaging

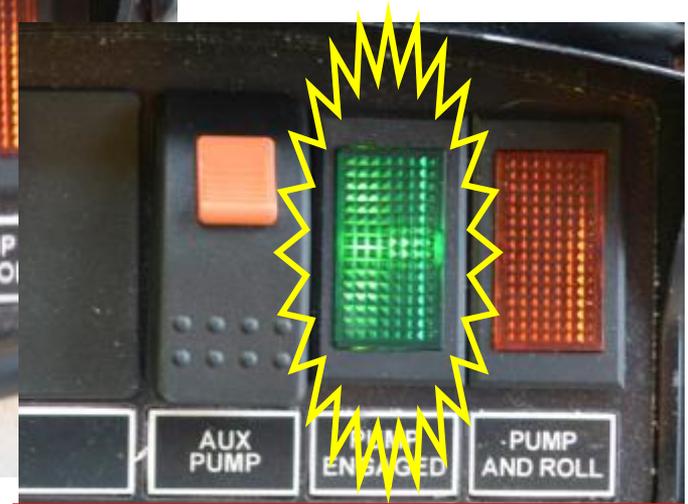
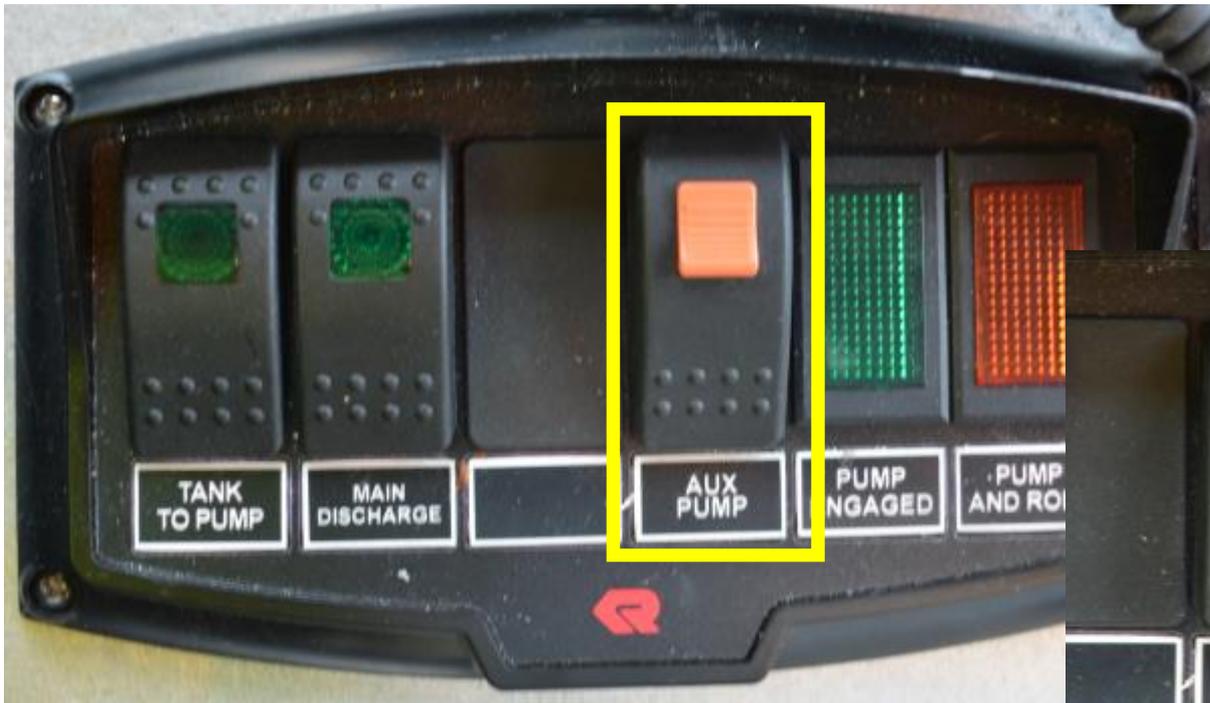


1. Park the vehicle and determine if all-wheel drive is desired
 - If AWD high or low range is desired engage BEFORE engaging Pump and Roll



Pump And Roll - Engaging

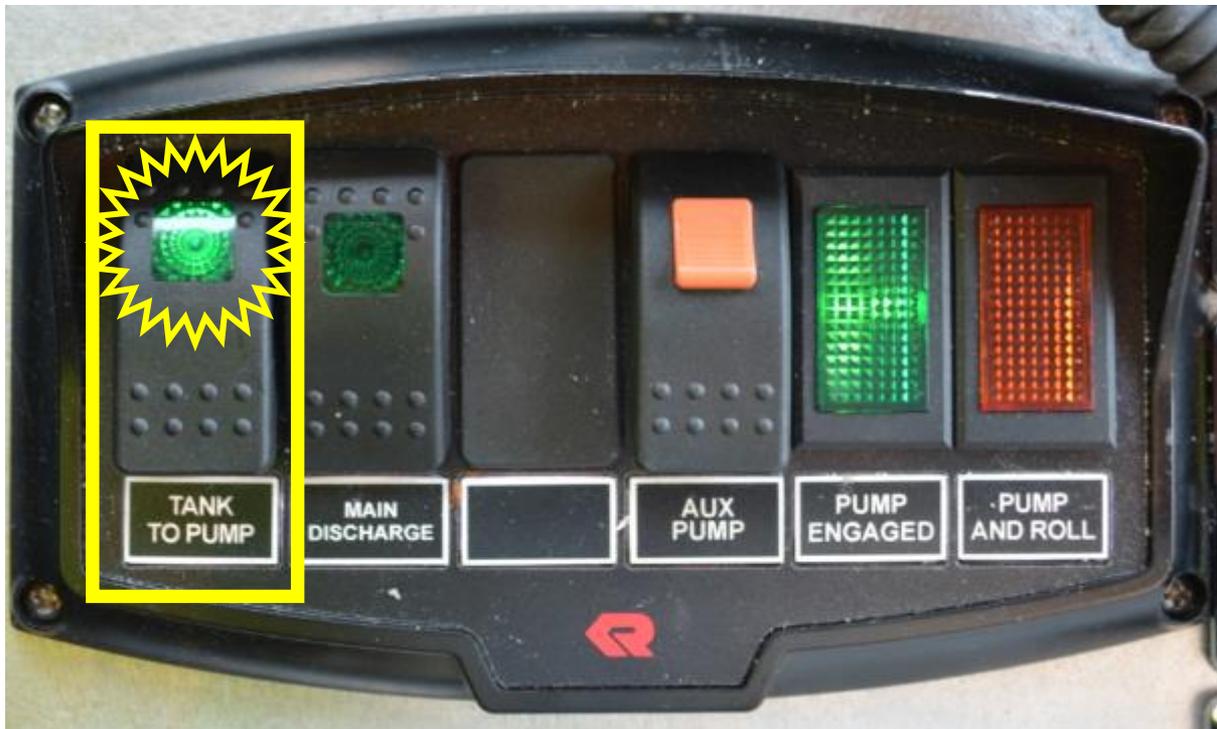
2. Activate auxiliary pump using AUX PUMP switch on the console.



PUMP ENGAGED should illuminate

Pump And Roll - Engaging

3. Acquire tank water by engaging the TANK TO PUMP switch on the console.

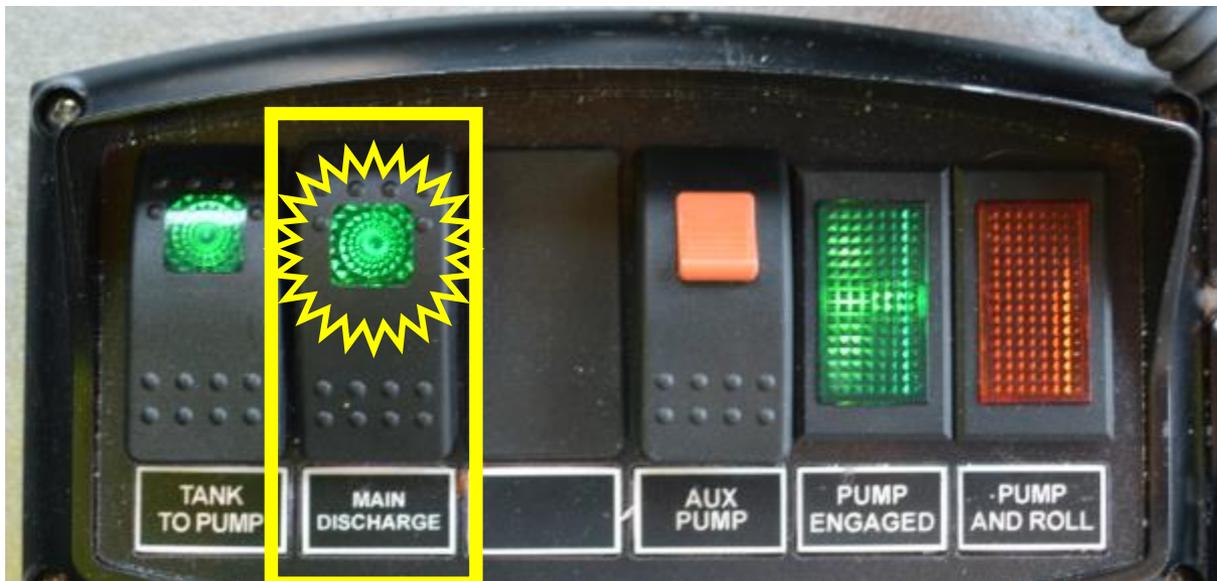


The onboard tank is the only water source for the auxiliary pump – this switch must be activated to get water to the pump.

Pump And Roll - Engaging



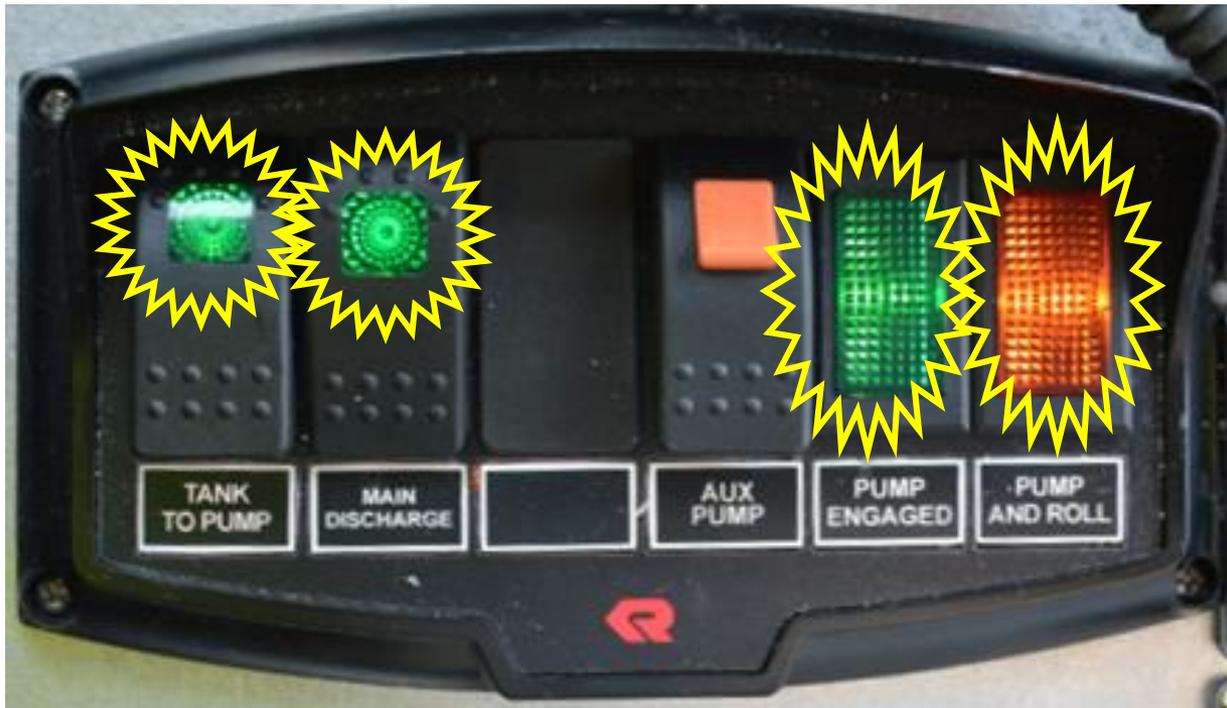
4. Open the discharge manifold for the auxiliary pump by engaging the MAIN DISCHARGE switch.
 - Note: This only opens the manifold – it DOES NOT open the individual discharges; the desired discharges must be opened on the main pump panel



Pump And Roll - Engaging



5. Verify TANK TO PUMP, MAIN DISCHARGE, PUMP ENGAGED, and PUMP AND ROLL lights are all illuminated



Pump And Roll - Discharges



- In addition to engaging the Pump and Roll system the desired discharge valves on the pump panel must be opened
- Discharge valves may be opened before or after the Pump and Roll system is engaged
- Pump and Roll only functions with the FRONT BUMPER DISCHARGE and HOSE REEL



Auxiliary Pump - Primer



- Primer for the auxiliary, or “pump and roll”, pump is manually activated when the Operator depresses and holds the PUSH TO PRIME button for the Auxiliary Pump.
- Follow all of the steps to engage the pump before attempting to prime



Auxiliary pump primer actuator

Pump And Roll - Troubleshooting



If all indicators are illuminated, but no water is available, the most likely causes are:

- the pump requires priming
 - utilize the manual primer located directly below the control console.
- the discharges at the pump panel are closed
- empty water tank





Pump And Roll - Capacities

- Auxiliary pump discharge pressures at corresponding motor RPM
 - 125psi @ 1100rpm
 - 150psi @ 1150rpm
 - 165psi @ 1200rpm
 - 190psi @ 1300rpm
 - 205psi @ 1350rpm
 - 210psi @ 1400rpm

NOTICE

**Auxiliary pump is
designed to disengage
at 1450rpm**

**Once Auxiliary Pump has automatically disengaged it will not automatically re-engage.
Auxiliary Pump engagement process must be repeated to re-use Pump and Roll.**

Hose Reel

- Pump and Roll Capable
- 150' of 1" booster line
- Elkhart Brass Chief 45gpm/100psi fog nozzle
- Electric rewind
 - Switch above reel
- Blowout valve located on driver side pump panel
 - Directs pressurized air (120psi) through the reel to push water out – be sure to open the nozzle to allow air and water to escape
 - Secure the nozzle before charging with air – nozzle will whip around if uncontrolled

Be sure to blowout the reel during cold weather – components will freeze quickly.



Reel rewind switch

Hose Reel Blow Out



Hose Reel



A hand crank is provided to rewind the reel manually if there is a failure in the motor or power.

The crank is stored in the upper left side of pump operator's compartment.



Hose Loads



Crosslays

250' - 1 1/2"
150/50/7/8"

250' - 2"
250/50/1 1/8"



250' - 3"
Gated wye

1000' - 4"

250' - 3"



Front Bumper

200' - 1 1/2"
150/50/7/8"



Hose Bed - Nets



Supply line must be fed between the hosebed wall and net. Disconnect both top buckles during a layout so the net drops clear of the hose.



Supply hose fed below the net will become entangled during layout.

Supply hose draped over the net will damage the net or jam the buckles.

Equipment Rack



- 10' attic ladder
- 14' roof ladder
- 24' extension ladder
- 15' hard sleeve
 - 2 additional 10' hard sleeves stored within body accessible from the rear
- 6' and 10' pike poles



Equipment Rack



- Switches located on officer side pump panel
 - Parking brake must be applied
 - Rack Enable light will illuminate



Off-Road Operations



- Brush Engines permit access to areas not otherwise reachable by standard engine companies – requires special situational awareness
- Making Access into the area
 - Identify escape routes and safety zones. Mark/flag them if necessary.
 - Escape time may be increased by route characteristics – grade, width, vegetation, other apparatus
 - Scene lighting should be used to provide maximum visibility at night.
 - Residents evacuating the area or attempting to make access into the area may make access difficult.
 - Driveways that are too narrow and/or steep to enter, branches overhanging the driveway or down-dead fuels or overgrown vegetation encroaching the drive should raise a red flag
- Adjacent Fuels
 - Be aware of fuel type, loading, and proximity to the access route and parking location.
 - Based upon the fuel, predict the potential fire behavior around your vehicle.
 - Beware of vegetation below the vehicle that could ignite from the exhaust components

Off-Road Operations



- May be necessary to send people or smaller units ahead to scout your route
 - Route characteristics may make it impossible to turn around – scouting ahead prevents delays and timely repositioning
- Rural lanes or right-of-ways may have bridges that are poorly maintained or of limited capacity
- When operating around structures, beware of underground propane tanks, septic fields, overhead wires, or well heads that could disable or damage the apparatus
 - Get out and look!



Water well head



Propane tank dome



Off-Road Operations



- In areas where vegetation poses an exposure hazard to the unit, position for egress or access to safe zones
- Identify water supply options early and take opportunities to keep the booster tank full
- Whenever operating in a vegetation fire environment, maintain LCES
 - Lookouts
 - Communications
 - Escape Route
 - Safety Zone

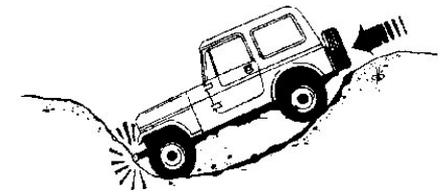


Off-Road Operations



Offroad operations present unique challenges that can quickly disable the apparatus, including:

- Approach and departure angles
- Ground clearance to rocks, logs, and stumps
- Long wheelbase that results in high-centering
- Drop-offs and steep slopes
 - Drive up and down steep grades; not across them



Approach angle



High-centering

Off-Road Operations



A Go/No-Go Checklist helps assess specific hazards during off-road situations:

1. Can you safely cross this hazard?
2. If you cross once, can you return on the same path?
3. Is there another route that is safer and easier on the environment?
4. Do you need to cross at this location?
5. If you get stuck or disabled at this location will you be able to get out without additional assistance?
6. Have you scouted the path ahead? Do you know what is on the other side of the hazard?
7. If you decide not to continue what effect will that have on your current assignment?
8. Does anyone know where you are? Do you have radio or cell phone contact?

Additional Resources



This document and other supporting documents are available at <https://www.montgomerycountymd.gov/mcfrs-psta/driver/DriverTrainingPierceEnforcer.html>

Members of the apparatus committee:

- Assistant Chief Pete Friedman
- Program Manager Steve Lamphier
- Battalion Chief Alan Butsch
- Chief Buddy Sutton (Laytonsville VFD)
- Firefighter Patrick Mann
- Maintenance Crew Chief Steve Neubauer

For information regarding hose loads and nozzles contact Battalion Chief David Polikoff.